

FIG. 1

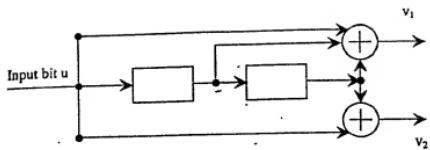


FIG. 3

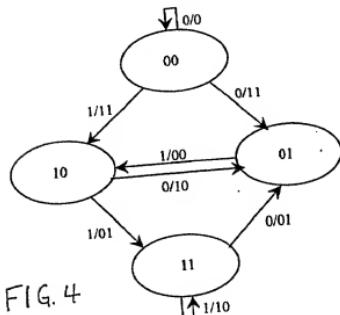


FIG. 4

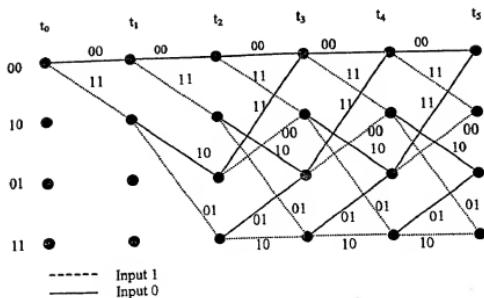
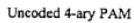
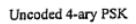


FIG. 5



Rate 2/3 coded 8-ary PSK



Rate 2/3 coded 8-ary PAM



FIG. 6

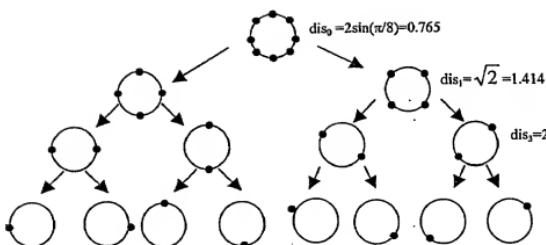


FIG. 7

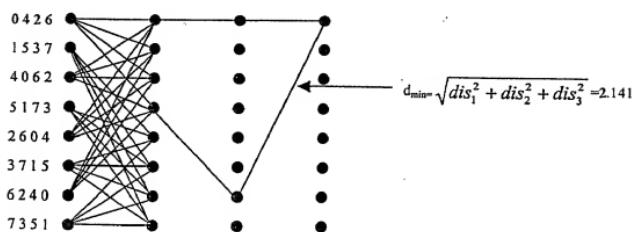


FIG. 8

Table 1 - State Transition Table for CTCM (4,3)

State	Input 0	Input 1	Input 2	Input 3
1	1	2	5	34
2	3	8	15	37
3	4	14	10	50
4	5	34	1	2
5	6	26	11	47
6	7	64	17	25
7	8	3	37	15
8	9	28	29	20
9	10	50	4	14
10	11	47	6	26
11	12	63	31	62
12	13	27	53	55
13	14	4	50	10
14	15	37	3	8
15	16	54	30	43
16	17	25	7	64
17	18	35	40	51
18	19	49	57	42
19	20	29	28	9
20	21	58	38	56
21	22	61	52	24
22	23	44	32	48
23	24	52	61	22
24	25	17	64	7
25	26	6	47	11
26	27	13	55	53
27	28	9	20	29
28	29	20	9	28
29	30	43	16	54
30	31	62	12	63
31	32	48	23	44
32	33	36	46	39

State	Input 0	Input 1	Input 2	Input 3
33	34	5	2	1
34	35	18	51	40
35	36	33	39	46
36	37	15	8	3
37	38	56	21	58
38	39	46	36	33
39	40	51	18	35
40	41	45	59	60
41	42	57	49	19
42	43	30	54	16
43	44	23	48	32
44	45	41	60	59
45	46	39	33	36
46	47	11	26	6
47	48	32	44	23
48	49	19	42	57
49	50	10	14	4
50	51	40	35	18
51	52	24	22	61
52	53	55	13	27
53	54	16	43	30
54	55	53	27	13
55	56	38	58	21
56	57	42	19	49
57	58	21	56	38
58	59	60	41	45
59	60	59	45	41
60	61	22	24	52
61	62	31	63	12
62	63	12	62	31
63	64	7	25	17
64	2	1	34	5

FIG. 9

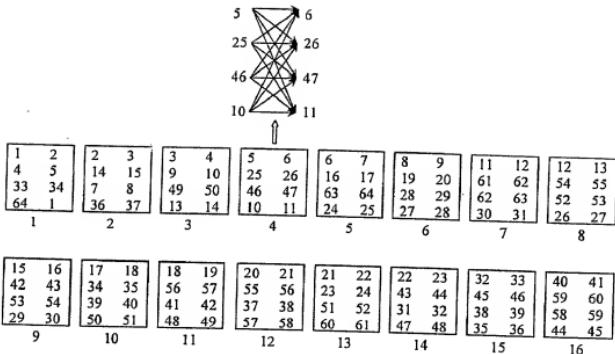


FIG. 10

stage 1 2 ... i ... D D+1

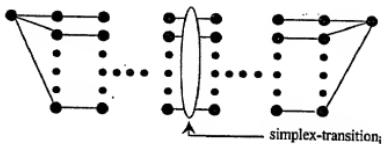


FIG. 11

TABLE 2

1	1	1	1	1
1	2	3	4	1
1	5	6	64	1
1	34	35	33	1
2	3	4	1	2
2	8	9	4	2
2	15	16	64	2
2	37	38	33	2
3	4	1	2	3
3	14	3	14	3
3	10	6	7	3
3	50	35	36	3
4	5	26	13	4
4	34	18	49	4
4	1	2	3	4
4	2	8	9	4
5	6	64	1	5
5	26	13	4	5
5	11	63	64	5
5	47	32	33	5
6	7	3	10	6
6	64	1	5	6
6	17	35	46	6
6	25	8	25	6
7	8	29	16	7
7	3	10	6	7
7	37	21	24	7
7	15	30	63	7
8	9	4	2	8
8	28	9	14	8
8	29	16	7	8
8	20	38	36	8
9	10	26	27	9
9	50	18	19	9
9	4	2	8	9
9	14	8	28	9
10	11	12	13	10
10	47	48	49	10
10	6	7	3	10
10	26	27	9	10
11	12	13	10	11

11	63	64	5	11
11	31	32	46	11
11	62	63	25	11
12	13	10	11	12
12	27	29	30	12
12	53	30	62	12
12	55	21	61	12
13	14	15	54	13
13	4	5	26	13
13	50	51	52	13
13	10	11	12	13
14	15	54	13	14
14	37	56	49	14
14	3	14	3	14
14	8	28	9	14
15	16	64	2	15
15	54	13	14	15
15	30	63	7	15
15	43	32	36	15
16	17	18	42	16
16	25	26	53	16
16	7	8	29	16
16	64	2	15	16
17	18	42	16	17
17	35	46	6	17
17	40	60	24	17
17	51	61	63	17
18	19	9	50	18
18	49	4	34	18
18	57	38	39	18
18	42	16	17	18
19	20	58	41	19
19	29	43	48	19
19	28	20	56	19
19	9	50	18	19
20	21	52	27	20
20	58	41	19	20
20	38	36	8	20
20	56	19	28	20
21	22	48	57	21
21	61	12	55	21

FIG. 12A

TABLE 2 (CONT.)

21	52	27	20	21
21	24	7	37	21
22	23	22	23	22
22	44	59	60	22
22	32	39	51	22
22	48	57	21	22
23	24	25	47	23
23	52	53	43	23
23	61	62	31	23
23	22	23	22	23
24	25	47	23	24
24	17	40	60	24
24	64	34	51	24
24	7	37	21	24
25	26	53	16	25
25	6	25	6	25
25	47	23	24	25
25	11	62	63	25
26	27	9	10	26
26	13	4	5	26
26	55	38	46	26
26	53	16	25	26
27	28	29	54	27
27	9	10	26	27
27	20	21	52	27
27	29	30	12	27
28	29	54	27	28
28	20	56	19	28
28	9	14	8	28
28	28	28	28	28
29	30	12	27	29
29	43	48	19	29
29	15	7	8	29
29	54	27	28	29
30	31	48	42	30
30	62	12	53	30
30	12	27	29	30
30	63	7	15	30
31	32	46	11	31
31	48	42	30	31
31	23	61	62	31
31	44	60	61	31
32	33	5	47	32
32	36	15	43	32
32	46	11	31	32
32	39	51	22	32
33	34	40	45	33
33	5	47	32	33
33	2	37	38	33
33	1	34	35	33
34	35	33	1	34
34	18	49	4	34
34	51	24	64	34
34	40	45	33	34
35	36	3	50	35
35	33	1	34	35
35	39	35	39	35
35	46	6	17	35
36	37	58	45	36
36	15	43	32	36
36	8	20	38	36
36	3	50	35	36
37	38	33	2	37
37	56	49	14	37
37	21	24	7	37
37	58	45	36	37
38	39	18	57	38
38	46	26	55	38
38	36	8	20	38
38	33	2	37	38
39	40	59	45	39
39	51	22	32	39
39	18	57	38	39
39	35	39	35	39
40	41	49	50	40
40	45	33	34	40
40	59	45	39	40
40	60	24	17	40
41	42	43	44	41
41	57	58	59	41
41	49	50	40	41
41	19	20	58	41
42	43	44	41	42
42	30	31	48	42
42	54	55	56	42
42	16	17	18	42
43	44	41	42	43
43	23	52	53	43
43	48	19	29	43
43	32	36	15	43
44	45	46	47	44
44	41	42	43	44
44	60	61	31	44
44	59	60	22	44
45	46	47	44	45
45	39	40	59	45
45	33	34	40	45
45	36	37	58	45

TABLE 2 (CONT.)

46	47	44	45	46
46	11	31	32	46
46	26	55	38	46
46	6	17	35	46
47	48	49	10	47
47	32	33	5	47
47	44	45	46	47
47	23	24	25	47
48	49	10	47	48
48	19	29	43	48
48	42	30	31	48
48	57	21	22	48
49	50	40	41	49
49	10	47	48	49
49	14	37	56	49
49	4	34	18	49
50	51	52	13	50
50	40	41	49	50
50	35	36	3	50
50	18	19	9	50
51	52	13	50	51
51	24	64	34	51
51	22	32	39	51
51	61	63	17	51
52	53	43	23	52
52	55	58	60	52
52	13	50	51	52
52	27	20	21	52
53	54	53	54	53
53	16	25	26	53
53	43	23	52	53
53	30	62	12	53
54	55	56	42	54
54	53	54	53	54
54	27	28	29	54
54	13	14	15	54
55	56	42	54	55
55	38	46	26	55
55	58	60	52	55
55	21	61	12	55
56	57	56	57	56
56	42	54	55	56
56	19	28	20	56
56	49	14	37	56
57	58	59	41	57
57	21	22	48	57
57	56	57	56	57
57	38	39	18	57
58	59	41	57	58

58	60	52	55	58
58	41	19	20	58
58	45	36	37	58
59	60	22	44	59
59	59	59	59	59
59	45	39	40	59
59	41	57	58	59
60	61	31	44	60
60	22	44	59	60
60	24	17	40	60
60	52	55	58	60
61	62	31	23	61
61	31	44	60	61
61	63	17	51	61
61	12	55	21	61
62	63	25	11	62
62	12	53	30	62
62	62	62	62	62
62	31	23	61	62
63	64	5	11	63
63	7	15	30	63
63	25	11	62	63
63	17	51	61	63
64	2	15	16	64
64	1	5	6	64
64	34	51	24	64
64	5	11	63	64

FIG. 12C

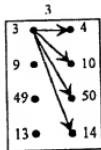


FIG. 13(e)

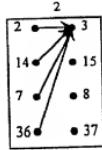


FIG. 13(f)

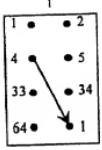


FIG. 13(g)

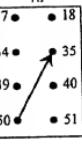
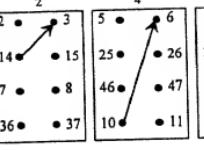


FIG. 13(i)

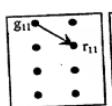


FIG. 14(a)

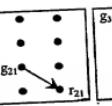


FIG. 14(b)

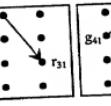
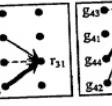
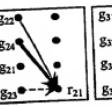
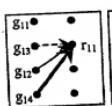


FIG. 14(c)



	2
7	3
2	15
14	37
36	8

2	1	4	10
7	3	64	1
2	15	1	5
14	37	4	10
36	8	33	46

FIG. 15(a)

2	1	4	10
7 3	64 1	25 6	17 35
2 15	1 5	5 11	34 51
14 37	4 34	10 47	50 40
36 8	33 2	46 26	39 18

FIG. 15(L)

FIG. 15(c)

$$\begin{array}{rrr} 1 & 2 & 3 \\ -1 & -2 & -3 \\ -1 & 2 & -3 \\ -1 & -2 & 3 \end{array}$$

FIG. 18

$$\begin{matrix} 1 & 3 & 5 \\ -1 & 4 & 6 \\ 2 & -3 & -6 \\ -2 & -4 & -5 \end{matrix}$$

$$\begin{array}{cccc} 1 & 3 & 5 & 1 -3 -5 \\ -1 & 4 & 6 & -1 -4 -6 \\ 2 & -3 & -6 & 2 3 6 \\ -2 & -4 & -5 & -2 4 5 \end{array} \quad \begin{array}{cccc} -1 & 3 & -5 & -1 -3 5 \\ 1 & 4 & -6 & 1 -4 6 \\ -2 & -3 & 6 & -2 3 -6 \\ 2 & 4 & 5 & 2 4 -5 \end{array}$$

FIG. 19(a)

FIG. 19(b)

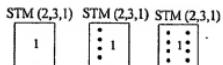


FIG. 16(a) FIG. 16(b) FIG. 16(c)

STM(:,3,1)

STM(:,1)

STM(:,1)

STM(:,1)

STM(:,1)

STM(:,1)

STM(:,1)

STM(:,1)

STM(:,1)

FIG. 16(d)

FIG. 16(e)

FIG. 16(f)

STM(:,1)

STM(:,1)

STM(:,1)

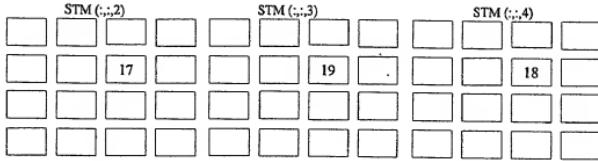


FIG. 16(g)

FIG. 16(h)

FIG. 16(i)

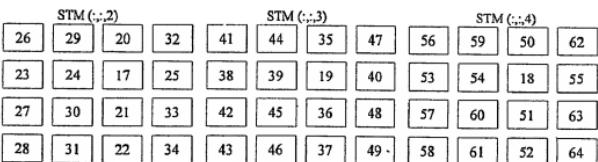


FIG. 16(j)

FIG. 16(k)

FIG. 16(l)

STM (2,3)			STM (.,3)			STM (.,.)		
1	1		2	3		2	3	
64	2		7	8		7	8	
4	5		14	15		14	15	
33	34		36	37		36	37	

FIG. 17(a)

1	1	6	64	3	4	1	1	35	33
64	2	63	7	13	14	64	2	32	36
4	5	16	25	9	10	4	5	38	46
33	34	24	17	49	50	33	34	45	39
34	35	34	35	17	18	50	51	39	40
17	18	17	18	50	51	39	40		
50	51	39	40						
5	6	5	6	25	26	10	11		
25	26	25	26	46	47	46	47		
10	11	10	11	19	20	36	37		

FIG. 17(b)

FIG. 17(c)

26	13	8	9	2	3	18	49
12	27	27	28	7	8	48	19
54	53	28	29	14	15	56	42
52	55	19	20	36	37	41	57
6	64	3	4	1	1	35	33
63	7	13	14	64	2	32	36
16	25	9	10	4	5	38	46
24	17	49	50	33	34	45	39
47	32	37	38	34	35	40	45
31	48	55	56	17	18	44	41
43	23	20	21	50	51	58	60
22	44	57	58	39	40	59	59
11	63	15	16	5	6	51	24
62	12	53	54	25	26	23	52
30	62	29	30	10	11	21	61
61	31	42	43	46	47	60	22

FIG. 17(d)

$(1,3,5), (1,-3,-5), (-1,3,-5), (-1,-3,5)$
 $(-1,4,6), (-1,-4,-6), (1,4,-6), (1,-4,6)$
 $(2,-3,-6), (2,3,6), (-2,-3,6), (-2,3,-6)$
 $(-2,-4,-5), (-2,4,5), (2,-4,5), (2,4,-5)$

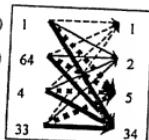


FIG. 20 (a)

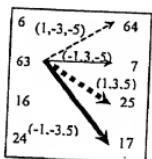


FIG. 20 (b)

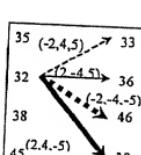
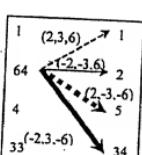
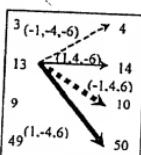


FIG. 21 (a)

FIG. 21 (b)

FIG. 21 (c)

FIG. 21 (b)

FIG. 21 (c)

IIS(:,1,1)				
1	3	5		
-1	4	6		
2	-3	-6		
-2	-4	-5		

FIG. 22 (a)

IIS(:,1,1)				
1	3	5		
-1	4	6		
2	-3	-6		
-2	-4	-5		

FIG. 22 (b)

IIS(:,1,1)				
1	3	5		
-1	4	6		
2	-3	-6		
-2	-4	-5		

FIG. 22 (c)

IIS(:,1,1)				
1	3	5	-1	-3
-1	4	6	1	-4
2	-3	-6	-2	3
-2	-4	-5	2	6

IIS(:,1,1)				
1	9	11	1	-9
1	10	12	-1	-10
-2	-9	-12	2	9
2	-10	-11	-2	10

IIS(:,1,1)				
7	-3	-11	-7	3
-7	-4	-12	7	11
3	8	3	12	-8
4	-8	4	11	8

IIS(:,1,1)				
-7	-9	-5	7	9
-6	7	-10	-6	10
6	-8	9	6	-9
5	8	10	5	-10

IIS(:,1,1)				
-1	9	11	1	-9
1	10	12	-1	-10
-2	-9	-12	2	9
2	-10	-11	-2	10

IIS(:,1,1)				
7	-3	-11	-7	3
-7	-4	-12	7	11
3	8	3	12	-8
4	-8	4	11	8

IIS(:,1,1)				
-7	-9	-5	7	9
-6	7	-10	-6	10
6	-8	9	6	-9
5	8	10	5	-10

FIG. 22 (d)

IIS(:,1,1)				
1	3	5	-1	-3
-1	4	6	1	-1
2	-3	-6	-2	2
-2	-4	-5	2	-4

IIS(:,1,1)				
1	9	11	1	-9
1	10	12	-1	-10
-2	-9	-12	2	9
2	-10	-11	-2	10

IIS(:,1,1)				
7	-3	-11	-7	3
-7	-4	-12	7	11
3	8	3	12	-8
4	-8	4	11	8

IIS(:,1,1)				
-7	-9	-5	7	9
-6	7	-10	-6	10
6	-8	9	6	-9
5	8	10	5	-10

FIG. 22 (e)

IIS(:,1,2)				
-1	1	-13	13	
1	-1	13	-13	
-2	2	-14	14	
2	-2	14	-14	

IIS(:,1,2)				
1	-1	13	-13	
-1	1	-13	13	
2	-2	14	-14	
-2	2	-14	14	

IIS(:,1,2)				
-7	7	-15	15	
7	-7	15	-15	
-8	8	-16	16	
8	-8	16	-16	

IIS(:,1,2)				
7	-7	15	-15	
-7	7	-15	15	
8	-8	16	-16	
-8	8	-16	16	

FIG. 22 (f)

IIS(:,1,3)				
-3	-17	3	17	
-4	-18	4	18	
3	17	-3	-17	
4	18	-4	-18	

IIS(:,1,3)				
-3	-17	3	17	
-4	-18	4	18	
3	17	-3	-17	
4	18	-4	-18	

IIS(:,1,3)				
-3	-17	3	17	
-4	-18	4	18	
3	17	-3	-17	
4	18	-4	-18	

IIS(:,1,3)				
-3	-17	3	17	
-4	-18	4	18	
3	17	-3	-17	
4	18	-4	-18	

FIG. 22 (g)

IIS(:,1,4)				
-5	-21	21	5	
-6	-22	22	6	
6	22	-22	-6	
5	21	-21	-5	

IIS(:,1,4)				
-5	-21	21	5	
-6	-22	22	6	
6	22	-22	-6	
-5	-21	21	5	

IIS(:,1,4)				
-5	-21	21	5	
-6	-22	22	6	
6	22	-22	-6	
-5	-21	21	5	

IIS(:,1,4)				
-5	-21	21	5	
-6	-22	22	6	
6	22	-22	-6	
-5	-21	21	5	

FIG. 22 (h)

IIS(:,2)

-1	33	41	1	37	-5	-13	-33	-45	13	-37	-41
1	34	42	-1	38	46	13	-34	-46	-13	-38	-42
-2	-33	-42	2	-37	-46	14	33	46	14	37	42
2	-34	-41	-2	-38	-45	14	34	45	-14	38	41
1	35	43	-1	39	47	13	-35	-47	-13	-39	-43
-1	36	44	1	40	48	-13	-36	-48	13	-40	-44
2	-35	-44	-2	-39	-48	14	35	48	-14	39	44
-2	-36	-43	2	-40	-47	-14	36	47	14	40	43
-7	-33	-43	7	-37	-47	-15	33	47	15	37	43
7	-34	-44	-7	-38	-48	15	34	48	15	38	44
-8	33	44	8	37	48	-16	-33	-48	16	-37	-44
8	34	43	-8	38	47	16	-34	-47	-16	-38	-43
7	-35	-41	-7	-39	-45	15	35	45	-15	39	41
-7	-36	-42	7	-40	-46	-15	36	46	15	40	42
8	35	42	-8	39	46	16	-35	-46	-16	-39	-42
-8	36	41	8	40	43	-16	-36	-45	16	-40	-41

FIG. 22 (l)

IIS(:,3)

-25	-3	-41	-25	-17	-45	29	3	45	-29	17	41
-25	-4	-42	25	-18	-46	-29	4	46	29	18	42
26	3	42	-26	17	46	30	-3	-46	-30	-17	-42
-26	4	41	26	18	45	-30	-4	-45	30	-18	-41
-25	-9	-43	25	-19	-47	-29	9	47	29	19	43
25	-10	-44	-25	-20	-48	29	10	48	-29	20	44
-26	9	44	26	19	48	-30	-9	-48	30	-19	-44
26	10	43	-26	20	47	30	-10	-47	-30	-20	-43
27	3	43	-27	17	47	31	-3	-47	-31	-17	-43
-27	4	44	27	18	48	-31	-4	-48	31	-18	-44
28	-3	-44	-28	-17	-48	32	3	48	-32	17	44
-28	-4	-43	28	-18	-47	-32	4	47	32	18	43
-27	9	41	27	19	45	-31	-9	-45	31	-19	-41
27	10	42	-27	20	46	31	-10	-46	-31	-20	-42
-28	-9	-42	28	-19	-46	-32	9	46	32	19	42
28	-10	-41	-28	-20	-45	32	10	45	-32	20	41

FIG. 22 (l)

IIS(:,4)

-25	-3	-5	25	-37	-21	-29	33	21	29	37	5
25	-34	-6	-25	-38	-22	29	34	-22	-29	38	6
-26	33	6	26	37	22	-30	-33	-22	30	-37	-6
26	34	5	-26	38	21	30	-34	-21	-30	-38	-5
25	-35	-11	-25	-39	-23	29	35	23	-29	39	11
-25	-36	-12	25	-40	-24	-29	36	24	29	40	12
26	35	12	-26	39	24	30	-35	-24	-30	-39	12
-26	36	11	26	40	23	-30	-36	-23	30	-40	-11
-27	33	11	27	37	23	-31	-33	-23	31	-37	-11
27	34	12	-27	38	24	31	-34	-24	-31	-38	-12
-28	-33	-12	28	-37	-24	-32	33	24	32	37	12
28	-34	-11	-28	-38	-23	32	34	23	-32	38	11
27	35	5	-27	39	21	31	-35	-21	-31	-39	-5
-27	36	6	27	40	22	-31	-36	-22	31	-40	-6
28	-35	-6	-28	-39	-22	32	35	22	-32	39	6
-28	-36	-5	28	-40	-21	-32	36	21	32	40	5

FIG. 22 (k)

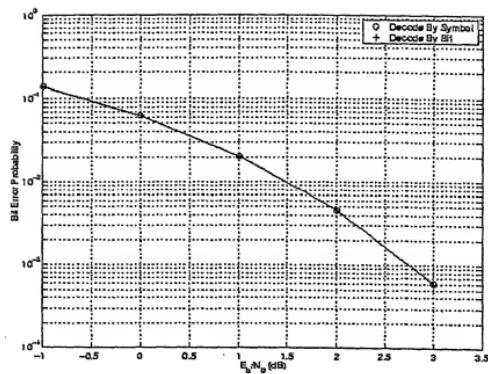


FIG. 23

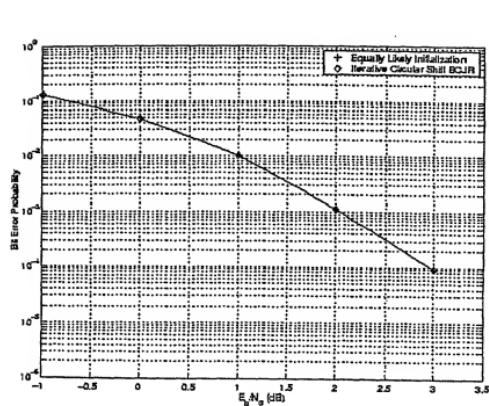


FIG. 26

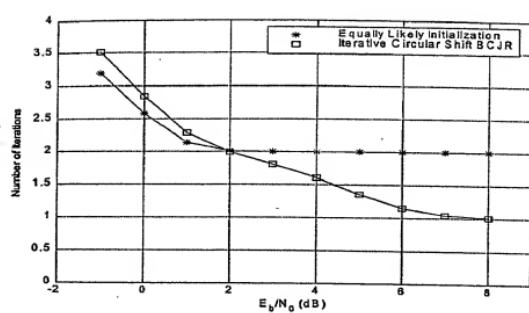


FIG. 24

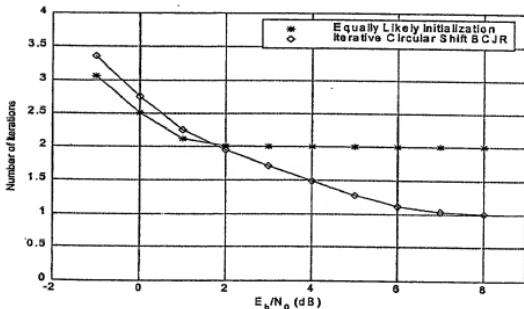


FIG. 25

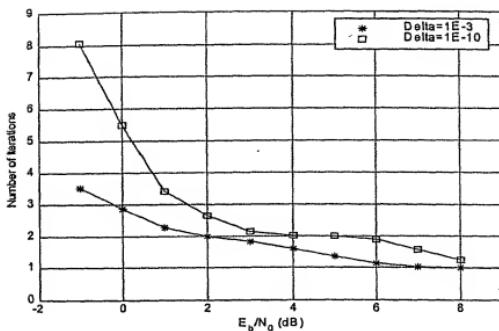


FIG. 27

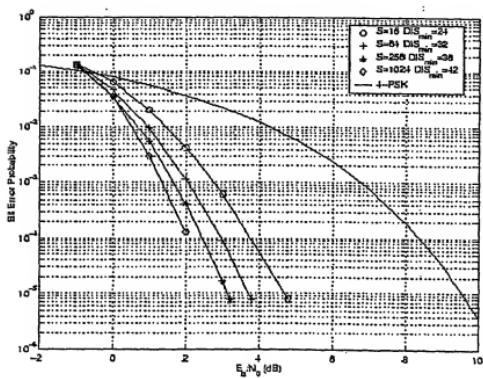


FIG. 32

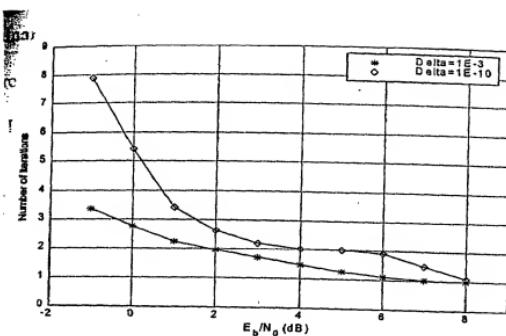


FIG. 28

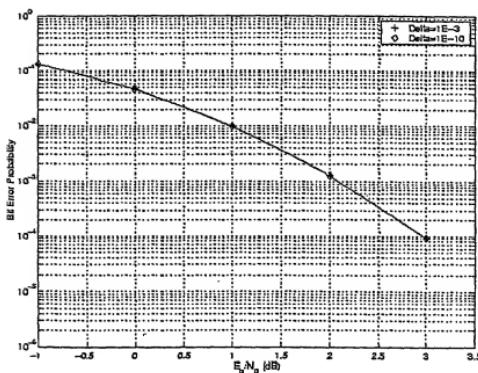


FIG. 29

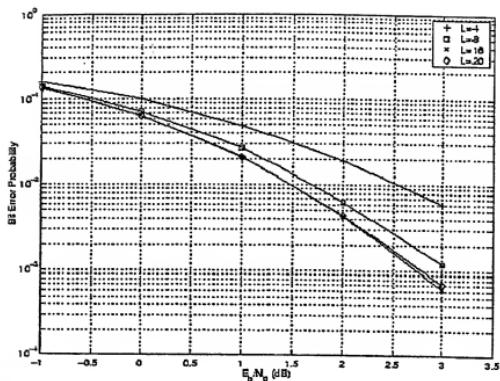


FIG. 30

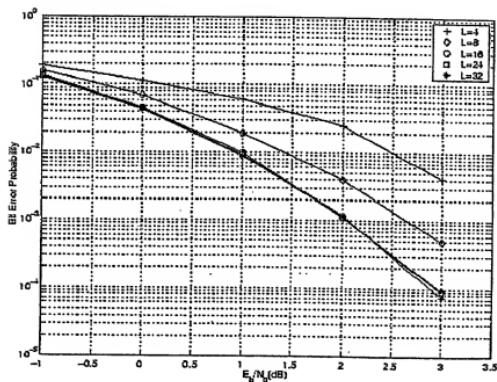


FIG. 31

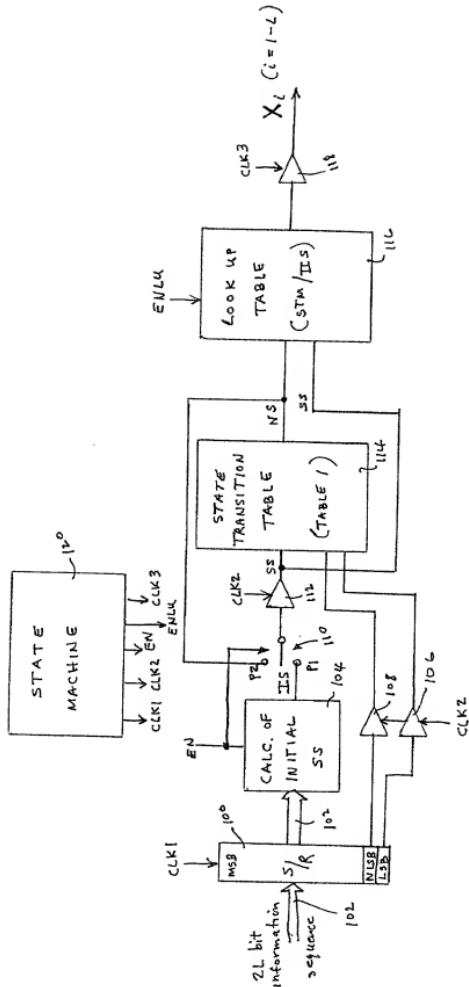


FIG. 33

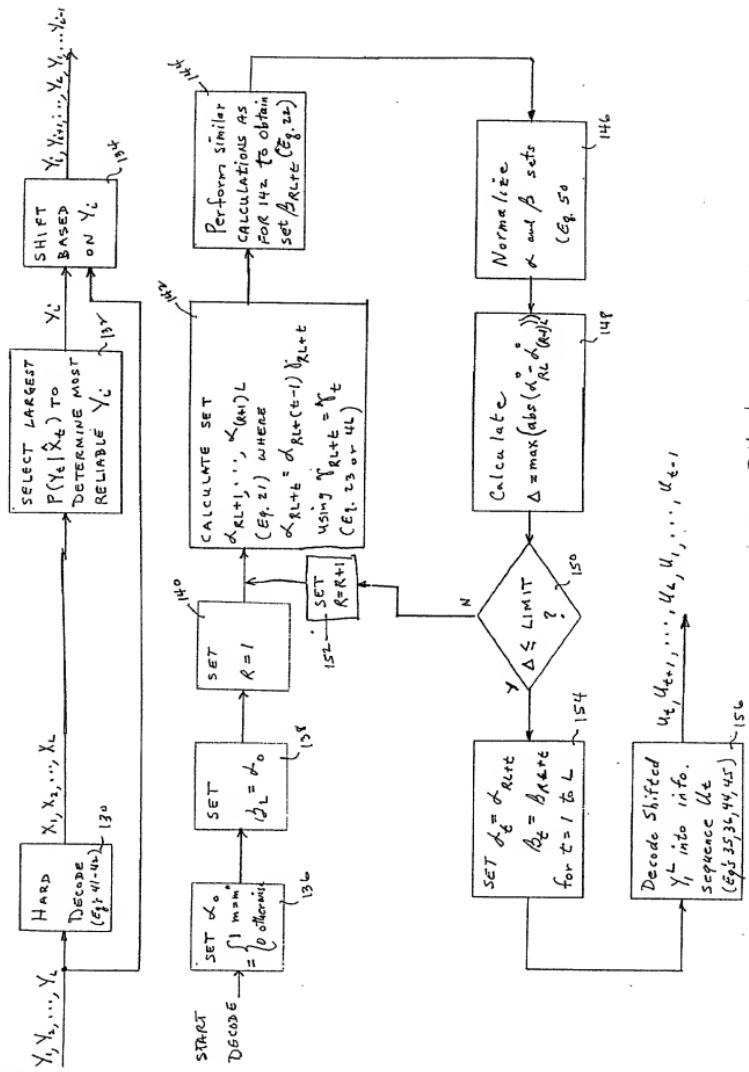


FIG. 34